Notice of Allowability	Application No.	Applicant(s)	
	10/727,670	ZHOU ET AL.	
	Examiner	Art Unit	
	Phuongchau Ba Nguyen	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *Pre-Amendment 3-12-04*.

2. ☒ The allowed claim(s) is/are *1-12*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 4-18-05; 3-12-04
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

REASONS FOR ALLOWANCE

1. The following is an examiner's statement of reasons for allowance:

Regarding claims 1-6, the prior art fails to teach a method in an OFDM direct conversion receiver, the method including "generating a complex pilot product, for each symbol subgroup position, by multiplying the pilot tones of a second subgroup symbol at the corresponding symbol subgroup position with the respective complex conjugates of a first subgroup symbol at the corresponding symbol subgroup position; obtaining an accumulated complex value by summing the complex pilot products of the symbol subgroup positions; and calculating the frequency error from the accumulated complex value for using in correcting frequency offset," which is considered in combination with other limitations, as specified, in the independent claim 1.

Regarding claims 7-12, the prior art fails to teach an OFDM direct conversion receiver including "a multiplier configured for generating a complex pilot product, for each symbol subgroup position, by multiplying the pilot tones of a second subgroup symbol at the corresponding

symbol subgroup position with the respective complex conjugates of the first subgroup symbol at the corresponding subgroup position; a complex summation circuit configured for accumulating the complex pilot products of the symbol subgroup positions to obtain an accumulated complex value; and an error calculator configured for calculating the frequency error from the accumulated complex value for use in correcting frequency offset," which is considered in combination with other limitations, as specified, in the independent claim 7.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

2. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Singh (US 2006/0291578A1) discloses an OFDM communication systems receiving embed system pilot symbols at expected index locations and correlated with computed complex conjugates of pilot symbols for providing a correlation function for the channel impulse response, and also including a frequency offset estimator used information for the maximum amplitude of the correlation function for providing a frequency synchronization adjustment to a numerically controlled oscillator NCO, see also figures 4-5, 7B, and 9.

Mody (US2006/0239370A1) discloses an OFDM systems having an auto-correlation circuit 75-fig.9A, wherein a received frame is demodulated into a data stream rn, which is input into a mixer 76 and a delay circuit 77. The delay circuit 77 delays the data stream by N1 samples such that a second input into the mixer 76 will be offset by N1 samples. The delayed data stream is processed by a complex conjugation circuit 78 which outputs the processed data stream to the second input of the mixer 76. Also, in figure 10 describes the phase

output from the auto-correlation circuit 75 is input into an offset estimation circuit 86 for estimating the frequency offset.

Fujii (US2005/0163238A1) discloses a transmitting method for transmitting a signal sequence by a number of subcarriers using OFDM and common pilot channel, in figure 37 describes two pilot signals of an identical symbol being inserted over all subcarriers and on receiving side, one of the two pilot signals is multiplied by the complex conjugate of the other pilot signal on a per-subcarrier basis and a mean value calculation unit for calculating the mean value of every real part and imaginary part of results of calculation for all subcarriers.

Dateki (US2005/0105593A1) discloses transmission power control method and apparatus in OFDM-CDMA wherein a pilot symbol pattern generator 76d outputs the position vector (already known) of an ideal pilot symbol point in the I-jQ complex coordinate system, a complex conjugate unit 76e outputs the complex conjugate of this position vector, and a multiplier (error vector unit) 76f calculates an error vector between

the position vector of the ideal pilot symbol, see also figures 6-7 and 0112-0114.

Magee (US2003/0227978A1) discloses a method of correctly estimating the frequency offset when the CPE modem has already acquired and is tracking the OFDM burst boundaries in an OFDM-based, wireless communication system. Magee discloses in figure 3 wherein the tones Y[k,b] of the current burst b are multiplied with the complex conjugates of the tones of the burst b-1. In case of integer frequency offset, these pilot tones are circularly shifted. A total of N/v such sum are formed and the index of the maximum of these sums indicates the position of the pilot tones. Also estimate integer frequency error offset corresponding to the maximum of Pa(l,n) the corresponding index lmax and the corresponding burst number nmax.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuongchau Ba

Nguyen whose telephone number is 571-272-3148. The examiner can normally be reached on Monday-Friday from 10:00 a.m. to 6:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on 571-272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PChau

Phuongchau Ba Nguyen
Examiner
Art Unit 2616

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SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600